Overview of Electricity Restructuring in the U.S.

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Why the U.S. is "Restructuring"

1. **Economic reasons:**
   1. More efficient production.
   2. More efficient trade.
   3. More efficient consumption.
2. **Real reasons:**
   1. High prices (especially in California and New York).
   2. Market "fundamentalism." (as defined by George Soros)

Has it worked?

- **I have seen no estimate of savings in any market.**
- **CA believes it lost over $9 billion in 2000-2001 and lost another $13 billion in forward purchases. Some think the total is $40 billion. These are just transfers from CA → Texas, this is not inefficiency.**
- **But, much money has been wasted with**
  1. Blackouts
  2. Bankruptcies
  3. Dispatch distortions caused by market power
  4. Regulatory and legal proceedings

Rough Guesses at U.S. Costs and Savings

- **Gains from trade $0.1 --- $1.5 billion/year**
  1. DOE puts total gains from trade at $13 billion, but almost all of this trade was occurring before restructuring.
- **Gains from more efficient operation of plants**
  1. $0.0 – $0.3 billion/year in PJM.
  2. Negative in CA (dispatch and market-power problems).
  3. Little if any in NY and NE.
- **Gains from more efficient consumption**
  1. Negligible in all regions.
- **Gains from more efficient generation investment**
  1. Doubtful.
  2. Far too much generation planned.
  3. Many cancellations.

Bottom Line (my rough guess)

- **Transmission planning has become more difficult and more is needed to prevent market power.**
- **Transaction costs have increased.**
- **Net Saving of + or – $1.5 billion/year. (ignoring CA)**
- **0.7% of retail cost if we are very lucky.**
- **In the long run**
  1. More efficient generation might save 10% (???).
  2. Less on-peak consumption might save 1 or 2 %.
- **It will take many years before U.S. consumers break even unless California recovers most of its losses (not likely).**

FERC's Role

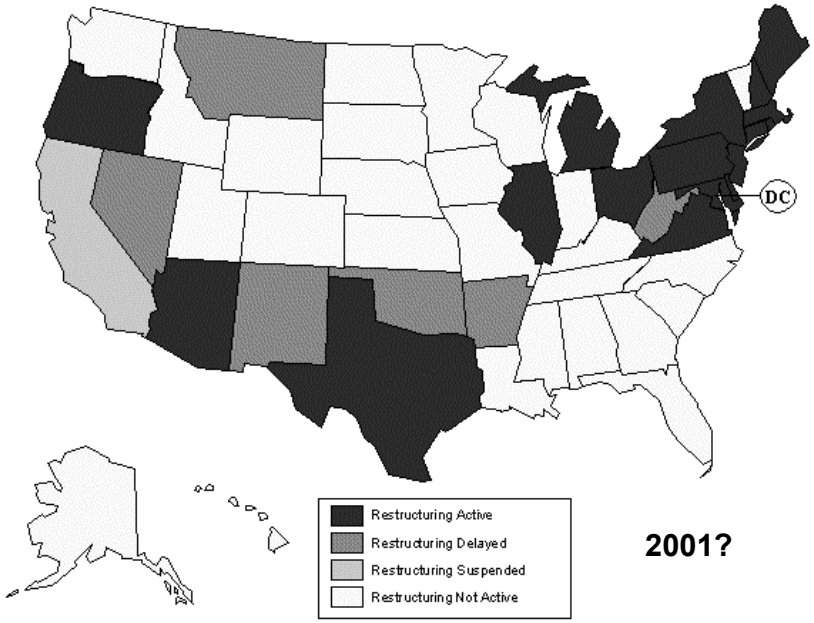
- **FERC's Order 888 (under Moler) in April 1996 gave "open access" to the transmission grid.**
  1. This worked very poorly but got the process started.
  2. The utilities own the grid and generation.
  3. They did not want new generators competing with their generation.
- **Order 888 also defined ISOs.**
  1. ISO rules must be approved by FERC.
  2. ISOs really did solve the grid-access problem within their boundaries.
  3. There were only 4, and they covered roughly ¼ of U.S. generation.

FERC Chairmen

- **Hoecker:**
  1. Allowed experiments with different types of ISOs.
  2. Had little understanding of power markets.
- **Hébert:**
  1. Advocated for-profit Transcos.
  2. Closely-associated with the utility industry.
  3. Super free-market ideologue.
  4. No understanding of power markets or competition.
- **Wood:**
  1. Back to non-profit RTOs.
  2. Wants a standard market design. PJM is the model.
  3. Approved the MISO RTO which has little structure compared with PJM or CA.
  4. Better understanding of power markets.

Regions

- **Eastern AC Interconnection**
  1. North-east: Old "tight" power pools. Now "poolco" style markets.
  2. Mid-west: In theory, the MISO which is now an RTO will achieve true open access to transmission.
  3. South: Old monopolies resist the market or try to maintain monopoly power in a market setting. Some are joining MISO to protect themselves from FERC.
- **Western AC Interconnection**
  1. California is tending toward re-regulation and a PJM-style poolco at the same time ???
  2. RTO West is like the mid-west.
- **Texas AC Interconnection: zonal like California.**



2001?

The North-East Poolco Approach

- **ISO conducts a day-ahead and real-time market.**
- **Generators "bid" every aspect of their plant.**
  1. A 10-part marginal cost curve
  2. Startup cost, No-load cost
  3. Minimum, maximum and emergency output
  4. Ramp rate and minimum run time
  5. Forty other items.
- **There is an hourly pool price that can be different at every electrical bus (1,000 – 2,000 buses).**
- **If a generator is selected and does not earn enough from the pool price to cover its costs, it receives a "make-whole" side payment.**

The North-East Poolco Approach (2)

- **"Virtual" bids are allowed. These can come from speculators who bid to buy or sell power a day in advance and then must close out their position in the real-time market.**
- **Bilateral traders may bid to pay up to $X/MWh for transmission from A to B.**
- **The result of virtual bids:**
  1. Prices in the day-ahead market are determined by arbitrage with the real-time market.
  2. Elaborate "unit commitment" calculations are a sham.

The North-East Poolco Approach (3)

- **Ancillary Services (operating reserves)**
  1. When the day-ahead market closes, the ISO computes what other generators it may need for reliability.
  2. It collects more bids, then promises certain generators that if they start up, it guarantees to cover their "as-bid" costs.
  3. This is part of the "pool" approach.
- **All three market have had Installed Capacity Requirements**
  1. PJM's is working best.
  2. Load-serving entities must have contracts with generation capacity equal to 118% of their peak load.

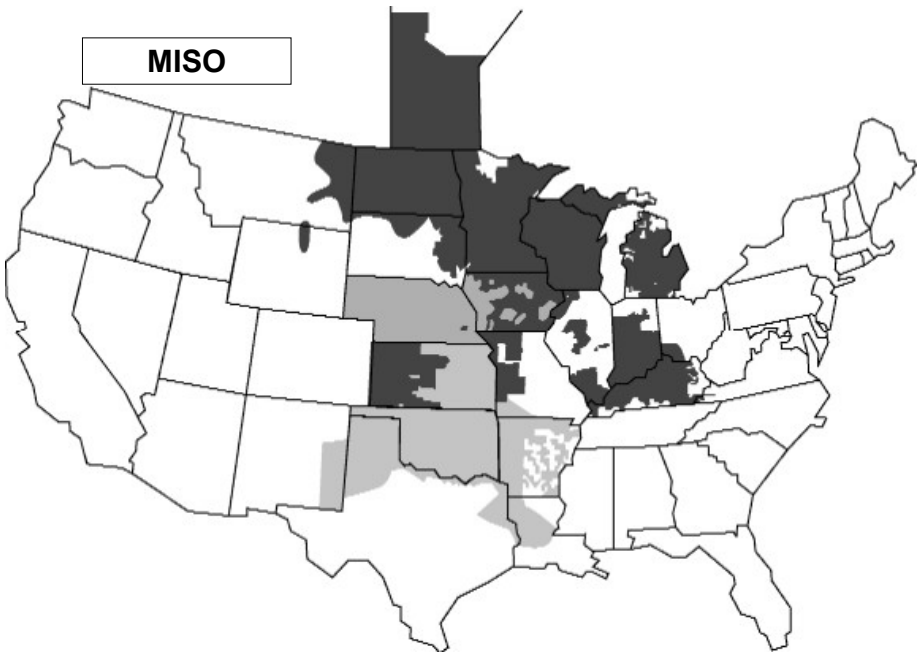
NY ISO *March 27, 2002*

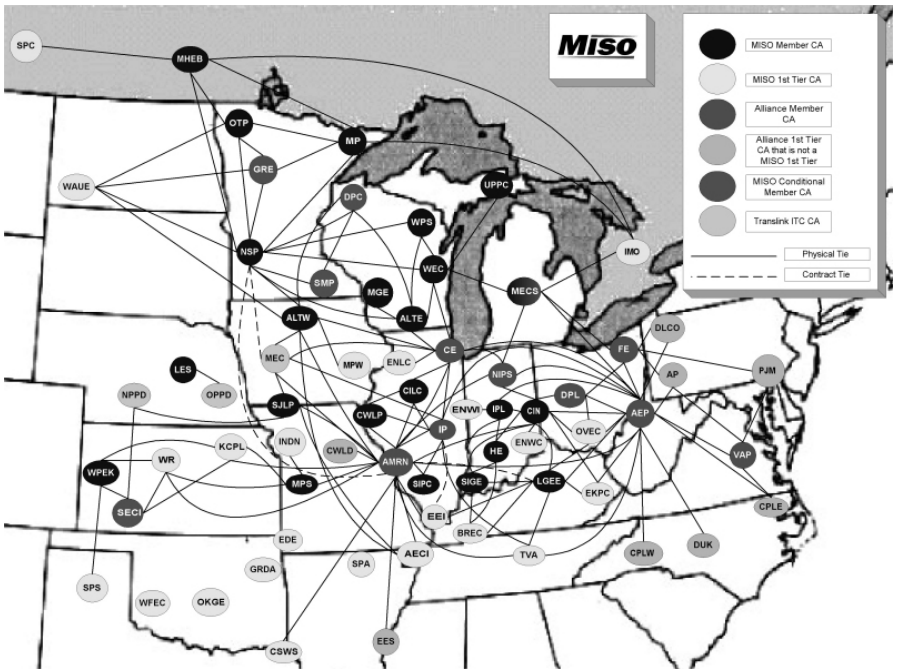
“A year after our release of the original *Power Alert* report, New York remains headed toward a very serious power shortage unless it acts immediately to get new supply sited and actually built within its borders,” said Mr. Museler, (Pres. of NYISO).

“In fact, since 1999, the growing disparity between supply and demand has meant that the state has been unable to cover its 18 percent reserve requirement from in-state generating sources. If this trend continues New York can expect to see increased prices, decreasing reliability and a negative impact on the environment.”

Mid-West ISO (MISO)

- **120 GW and still growing. It is now in operation.**
- **FERC has proposed that existing RTO’s (I.e. MISO) will be exempt from their new Standard Market Design.**
- **Bilateral traders now go through MISO instead of having to deal with their local utilities.**





What Happened in California?

- **System designed by old utilities, power marketers and large industrials.**
- **Philosophy:**
  1. Started out as a poolco design.
  2. Then power marketers got the upper hand and restricted the ISO and PX as much as possible.
- **ISO does (1) real-time dispatch and (2) congestion management without energy trading.**
- **PX does day ahead trading.**
- **PX is one of many equal "scheduling coordinators"**
  1. All others are private.
  2. Utilities must trade through the PX for 5 years.

Who Shot the PX?

- **FERC always wanted the PX to be part of the ISO because they favored the PJM poolco approach.**
- **FERC learned that long-term contracts reduce market power.**
- **They thought making the utilities trade through the PX prevented long-term contracts.**
- **Hoecker went a little bit crazy.**
- **FERC killed the PX. California could do nothing about it.**

What Caused the California Disaster?

- **Gas prices went way up. (Started at $3, peaked at $60.)**
- **Imports into CA went down about 4 GW due to shortages.**
  1. CA did not have a supply shortage other than the drop in imports.
- **The utilities had to sell at regulated retail prices and buy power at unregulated wholesale prices.**
- **They started postponing payments to power suppliers and then many suppliers throughout the West stopped selling to the utilities.**

California Crisis Continued

- **The financial (credit) crisis combined with market power caused blackouts. FERC refused to act, and the Secretary of Energy had to declare an emergency to force western suppliers to sell to CA.**
- **The state started buying power for the bankrupt utilities to solve the financial crisis. FERC put the necessary price caps in place throughout the west, gas prices fell, and the crisis ended.**
- **Prices were high for 4 reasons**
  1. High gas prices (partly due to market power in the gas-electric market)
  2. Western supply shortage
  3. Market power in the electricity market
  4. Financial risk premiums
- **Gaming of flawed market rules played an extremely small role.**

California Today

- **A state-legislative committee is conducting a witch hunt for those who "gamed" the system. This is diverting attention from the real problems and hurting many innocent people.**
- **The state's many regulatory bodies are helping "design" the new market. They want it highly regulated.**
- **Some generators and big industrial customers want a PJM style poolco.**
- **The ISO is trying to do both at once.**
- **???**

Texas (ERCOT)

- **60 GW peak load. Not under FERC.**
- **RTO with emphasis on retail deregulation.**
- **Uses bilateral trading with a zonal congestion pricing model similar in spirit to California's.**
- **On June 7th, the chairman of the board of directors of ERCOT resigned.**
  1. Some 300,000 households have experienced problems switching to a new supplier or moving into a new home. Some of them have received power but have not been billed for several months.

FERC's Standard Market Design

- **Requires "LMP" or "nodal pricing."**
- **Requires day-ahead and real-time markets.**
- **Requires tradable transmission rights.**
  1. Either point-to-point or flowgate rights.
  2. "Points" can be trading hubs.
- **"Bidding parameters must allow suppliers the opportunity to reflect the costs and operational constraints of production in the energy market."**
- **Nodal pricing must be used for both buyers and sellers in the day-ahead market.**

FERC's Standard Market Design (SMD)

- **Basically they have specified PJM.**
- **They are trying to allow more flexibility in transmission rights.**
- **FERC is still debating installed capacity requirements.**
- **It may have little effect:**
  1. PJM, NY, and NE are already doing it.
  2. MISO will not have to follow it.
  3. RTO-West may also become exempt.
  4. Texas is not under FERC's jurisdiction.
  5. Only California is left.

Price Volatility and Investment

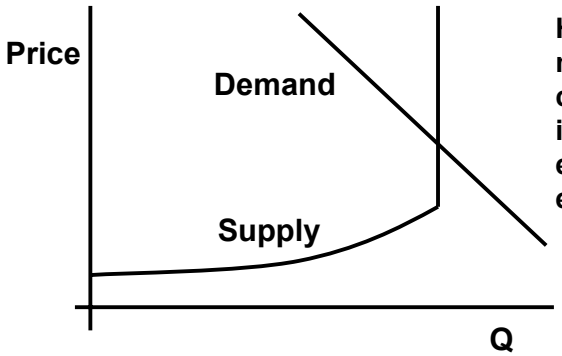
- **Prices hit $7000/MWh one summer, $9000 the next in the mid-west, and $6000/MWh in NY in May 2000.**
- **They hit $1000/MWh every summer in PJM (and considerably higher for the occasional secret emergency purchase).**
- **Similar deals in CA reached $4000/MWh.**

Price Volatility and Investment (2)

- **FERC has declared the price cap should be**
  1. $1,000 for PJM
  2. $10,000 for NYISO
  3. $1,000 for PJM, NYISO, and ISO-NE
  4. Infinity (ex-chairman Hebert)
  5. About $100 for California and the West, but only for 18 months. (Pat Wood's explanation: "If there's a fire in the kitchen you don't look to see what's in the slop bucket, you just throw it on.")
- **Australia feels it needs a $15,000 price cap to stimulate adequate generation investment.**

Price Volatility and Investment (3)

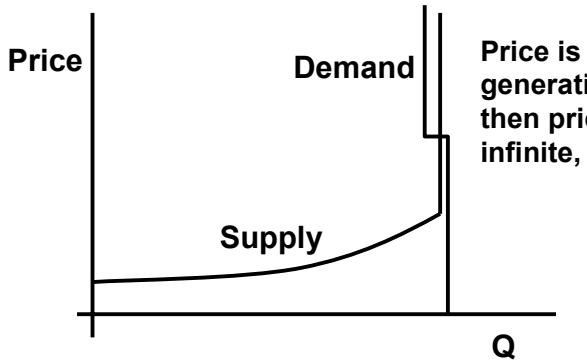
- **Could the market solve the investment problem?**
- **Yes, with sufficient demand elasticity and no policy of raising the price when operating reserves are short.**



High prices with no operating reserve can induce optimal investment, if there is enough demand elasticity.

Price Volatility and Investment (4)

- **With too little demand elasticity there is no long-run equilibrium.**
- **If generation is adequate it cannot cover fixed costs.**



Price is rarely high unless generation is inadequate, then price is sometimes infinite, i.e. the market fails.

Fixing the Market Failure

- **Method 1: Low price cap + Installed capacity requirement backed by a penalty.**
- **Method 2: Any price cap below VOLL + an operating reserve requirement.**
- **Method 3: Mix of 1 and 2.**
- **The problem in the U.S.: It is politically impossible to say that a price cap is really needed as part of the market, so we cannot discuss this policy.**

  Reserve requirements and caps are picked by different agencies that do not communicate.

The Trade Off

- **A very high price cap is needed with no reserve requirements.**
- **A very low price cap is optimal with high reserve requirements.**
- **Moderate price spikes should be tolerated to induce a demand response.**
- **But very high price spikes produce huge year-to-year variations in profit (as seen in the U.S.).**
- **Such volatility carries a high investment risk premium and politicizes the market design process.**

The End